Computer Figures Risk of Rust in Wheat

When the winter wheat planting season approaches, a farmer in the Central Great Plains might like to consult a crystal ball.

Would it be advisable to gamble by planting the highest yielding hard red winter wheat variety available—or a lower yielding variety that better resists leaf rust fungi?

Anything could happen. But the weather over the past few months can provide some clue as to prospects for a rust epidemic the next spring.

Unveiled last summer is a science-based computer model nicknamed "Rusty" to appraise the situation through the fall and winter and predict the likelihood of rust in next summer's crop.

"We developed the model to help wheat growers make management decisions in both fall and spring," says ARS plant pathologist Merle G. Eversmeyer, who is based at Manhattan, Kansas.

In the fall, growers must decide which variety to plant. In the spring, they must decide whether applying a fungicide to reduce yield losses from rust would be worth the expense.

Presently there are no biological controls to fight rust. But, if such controls were developed for commercial use, the model could play an important role in their management, Eversmeyer says.

It tracks the impact of both locally produced leaf rust spores surviving the winter on infected leaves and spores blowing in from miles away. To develop Rusty, the researchers used computers to crunch weather data gathered over 10 years, along with data from observations on the rust fungus over that time.

As seasons change, so does the importance of different kinds of weather data. For example, snow cover, which moderates temperature fluctuations in infected wheat tissue in winter and early spring, is more important than average daily minimum temperatures to the survival of rust fungi.

Until planting decision time, rainfall since harvest is a small but influential variable influencing leaf rust predictions, says Eversmeyer. Soil moisture is an indicator of how much volunteer wheat will spring up from wheat seeds left in the field during harvest. Volunteer wheat hosts fungal mycelium and spores that may survive until they are able to infect the newly planted crop.

If spores survive the winter, a local rust epidemic reducing yield from 2 to 10 percent is virtually certain, Eversmeyer says.

With each 2-week interval throughout the crop year, new weather information along with field observations on rust inoculum survival are used to enhance the accuracy of Rusty's predictions. As spring approaches and the wheat turns green, an accurate rust severity prediction can become most important to growers. During the following 6 weeks they must decide whether or not to apply a fungicide, because spraying later might leave a residue in the grain.

Rusty runs under MS-DOS on an IBM-compatible personal computer. Plans are under way to make it available on the World Wide Web, with updates at least every 10 days.

Farmers can start using Rusty by contacting extension wheat pathologist Robert Bowden, Department of Plant Pathology, Kansas State University, Manhattan, KS 66506; phone (913) 532-6176.—By **Ben Hardin**, ARS.

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Wheat plants on the left resist leaf rust fungi, while browning leaves on right show plants are susceptible to a rust that typically cuts yield 2 to 10 percent .